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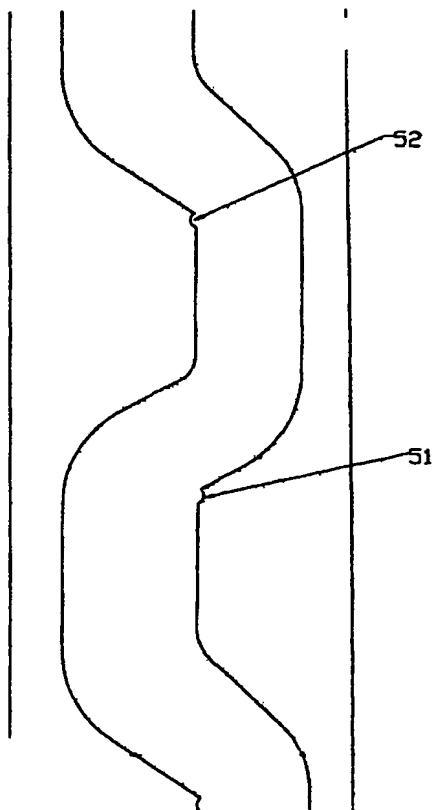
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TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

[Continued on next page]

(54) Title: GAS CLEANING PROCESS AND EQUIPMENT THEREFOR



(57) Abstract: The invention relates to equipment for use in the removal of relatively fine particulates from a first substance, using a second substance. The equipment includes a static, co-current contacting mixer section, having a plurality of stages defining a flow path, with a flow profile, for the first and the second substance, at least some of the stages being shaped to define a substantially curved flow path having an effective centre of curvature located to one side of the flow path, and wherein each adjacent stage has a centre of curvature on an opposite side of the flow path to provide a point of inflexion between adjacent stages and whereby, as the substances flow through the reactor between the adjacent stages, particles present in the first substance migrate through the second substance, first in one direction and then in a substantially opposite direction to promote interphasic interaction between the first and the second substance, the flow path characterised in being provided with an edge formation (51,52) between at least two adjacent stages towards the point of inflexion so as to enhance the launch of the second substance on the outside of the curved flow path of one stage at relatively high velocity from the edge formation to the inside of the curved flow path of the adjacent stage, thus increasing the contact between the first and the second substances. The equipment also includes a cyclonic section and a spinner section. The invention also relates to a method for the removal of relatively fine particulates from a gas stream, using a scrubbing fluid, as well as a plastic composite material for the manufacture of the equipment.



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INTERNATIONAL SEARCH REPORT

National Application No
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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B01J19/24 B01F5/06 C08K3/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B01F B01J B01D C08K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 94/29017 A (ATOMAER PTY LTD ;BODNARAS GEORGE (AU)) 22 December 1994 (1994-12-22) abstract page 5, line 1 - line 36; figure 1 page 14, line 16 - line 36; figure 7	1-47
A	EP 0 608 902 A (CANON KK) 3 August 1994 (1994-08-03) abstract page 8, line 36 -page 9, line 9; figures 3-12	1-47
X	US 4 551 496 A (RENLUND GARY M ET AL) 5 November 1985 (1985-11-05) abstract column 2, line 53 - line 55 column 3, line 47 - line 54 claim 1	48-56
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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

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X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

G document member of the same patent family

Date of the actual completion of the international search

3 June 2004

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18.06.04

Name and mailing address of the ISA

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/ZA 03/00160

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 100 36 499 A (NOMIG GMBH) 8 February 2001 (2001-02-08) column 1, line 35 - line 63 claims 1,4,5 ----	48-56
X	GB 942 756 A (KALLE AG) 27 November 1963 (1963-11-27) page 1, line 10 - line 12 page 2, line 37 - line 49 page 3, line 128 -page 4, line 1 example 1 claim 1 ----	48-56
A	DE 24 57 446 A (METZELER KAUSCHUK) 10 June 1976 (1976-06-10) page 4 claim 1 -----	50

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/ZA 03/00160

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 9429017	A	22-12-1994	AU 697093 B2	24-09-1998
			AU 6920694 A	03-01-1995
			WO 9429017 A1	22-12-1994
			CA 2164340 A1	22-12-1994
			EP 1405667 A2	07-04-2004
			EP 0701474 A1	20-03-1996
			FI 955775 A	28-12-1995
			JP 9504466 T	06-05-1997
			NZ 267029 A	24-03-1997
			SG 46212 A1	20-02-1998
			US 5741466 A	21-04-1998
			ZA 9403903 A	02-02-1995
EP 0608902	A	03-08-1994	JP 3005132 B2	31-01-2000
			JP 6230606 A	19-08-1994
			JP 2984505 B2	29-11-1999
			JP 6226208 A	16-08-1994
			CN 1096471 A ,B	21-12-1994
			DE 69427169 D1	13-06-2001
			DE 69427169 T2	25-10-2001
			EP 0608902 A1	03-08-1994
			ES 2156130 T3	16-06-2001
			KR 135061 B1	20-04-1998
			US 5447275 A	05-09-1995
US 4551496	A	05-11-1985	NONE	
DE 10036499	A	08-02-2001	DE 10036499 A1	08-02-2001
GB 942756	A	27-11-1963	CH 392311 A	15-05-1965
			US 3177056 A	06-04-1965
DE 2457446	A	10-06-1976	DE 2457446 A1	10-06-1976
			AT 348884 B	12-03-1979
			AT 921375 A	15-07-1978
			CH 606233 A5	31-10-1978
			FR 2293325 A1	02-07-1976

INTERNATIONAL SEARCH REPORT

International application No.
PCT/ZA 03/00160

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this International application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☒ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-47

An apparatus and the corresponding method for the removal of fine particles from a fluid, the apparatus comprising a curved flow path with some edges within the flow path.

2. Claims: 48-56

A plastic material comprising an abrasion resistant composite.